Because of the importance that regenerative phenomena have in the consideration of certain fundamental biologic problems, one might be tempted to try to find some significance in whatever special examples of regeneration happen to come under one's own observation. The relation between physiological regeneration and restorative regeneration is a subject very near at hand, if one were to look for something to speculate about in connection with what I have noted in this paper on regeneration in insects. But with Morgan, it seems to me that 'we do not gain any insight into either of the processes, so far as I can see, by deriving one from the other, for the process of restorative regeneration may be in point of time as old as that of physiological regeneration.' Indeed, among the insects we have good grounds for believing restorative regeneration older than the particular processes of physiological regeneration which regularly accompany the post-embryonic development of insects with complete metamorphosis. For these insects are admittedly the recent, the post-Tertiary, ones, while the Orthoptera, among which, especially, restorative regeneration is widespread and unusually well developed, are among the oldest of living insect orders. They make up the bulk of insects known from pre-Tertiary times. The most extensive and radical of physiological regeneration processes occur precisely among the most specialized, the most recent, insects.

Finally, as concerns the large question of whether regeneration is to be looked on as a certain primary, primitive, attribute of organisms whose manifestation becomes weaker as complexity in structure and function is attained (in course of descent), or whether, as is held by the Neo-Darwinians, it is to be looked on as an adaptation which has been transmitted through a long and many-branched course of descent, gradually weakening during this transmission until in the more complex organisms it is largely lost, although, in consonance with need, often retained even among higher forms, this is a question I shall refer to only in so far as to say that the evidence presented by all that we know of regeneration in insects, taken together, certainly does not warrant any such definite conclusion as Tornier expresses on the basis of his experiments with certain dragon-fly and May-fly larvæ, viz., that regeneration in insects is an adaptation produced by natural selection.

acters of Reproduced Appendages in Arthropoda, Particularly in the Blattidæ,' *Proc. Zool. Soc. London*, 1898, pp. 924–928; and Tornier, *Zool. Anzeig.*, Vol. 24, 1901, pp. 634–664.

VERNON L. KELLOGG.
STANFORD UNIVERSITY, CAL.

A PRELIMINARY NOTE ON ASCUS AND SPORE FORMATION IN THE LABOULBENIACEÆ.

CONCERNING the systematic position of the Laboulbeniaceæ many opinions have been expressed. DeBary (1884) included them in his doubtful Ascomycetes; Thaxter (1895), of all best qualified to speak, referred them to the Ascomycetes; Karsten (1895) maintained that they were not Ascomycetes at all, but that they occupied a position intermediate between the smuts and the Pyrenomycetineæ, while Engler ('Syllabus der Pflanzenfamilien,' 1903) has elevated them to the rank of a class quite removed from both the smuts and the Ascomycetes. These differences in opinion have arisen from a lack of knowledge of the actual phenomena of spore production, a gap due to difficulties in obtaining and manipulating material suitable for cytological investigation.

In the course of recent investigations on the Ascomycetes I have given some attention to these peculiar and interesting forms, and an examination of microtome sections of well-preserved perithecia has revealed features that are apparently of undoubted significance in their bearing on the problem of the phylogenetic position of this group.

As for the spore sac, it has been discovered that each is primarily occupied by a fusion nucleus. Three successive nuclear divisions follow. The spore initials are delimited from an abundant epiplasm under the superintendence of the last generation of nuclei. The young spores are bounded by a plasma membrane, and the cavities in the epiplasm in which they lie are lined by a membrane of similar character. Indeed, the phenomena of

sporogenesis agree in all essentials with those already described for the Ascomycetes (Faull, 'Contributions from the Cryptogamic Laboratory of Harvard University,' LXI., in which there is a complete bibliography). Details and further researches in this group, which heretofore has not been subjected to microtonic methods, will be described in a forthcoming paper.

J. HORACE FAULL.

UNIVERSITY OF TORONTO,
December 2, 1905.

INBREEDING, CROSS-BREEDING AND STERILITY IN DROSOPHILA.

A SERIES of breeding experiments with the common pomace-fly, *Drosophila ampelophila* Loew., conducted during the past five years principally by my pupils and still in progress, has yielded certain results which it is the purpose of this note to summarize. A fuller account will soon be published elsewhere. Those who have taken part in the work are Thomas Ordway, Austin H. Clark, F. W. Carpenter, S. O. Mast, W. M. Barrows and myself. The part of each will be indicated in the final publication. The more important conclusions reached may be stated thus:

1. Inbreeding probably reduces very slightly the productiveness of *Drosophila,* but the productiveness may be fully maintained under constant inbreeding (brother with sister) if selection is made from the more productive families.

2. In crosses of a race of low productiveness and frequent sterility (race *A*) with a race of high productiveness (*B*) it has been found that a female of race *A* does not have her fecundity increased by mating with a male of race *B,* and conversely, a female of race *B* does not have her fecundity diminished by a mating with a male of race *A*. Hence every male not actually sterile furnishes an abundance of functional spermatozoa.

3. The cross-breds produced by the mating, *B* female $\times$ *A* male, are all of high productiveness.

4. The cross-breds produced by a mating *A* female $\times$ *B* male are usually, but not always of high productiveness.

5. The children of both sorts of cross-breds (see 3 and 4) are some of high productiveness like race *B,* others of low productiveness like race *A*.

6. Low productiveness is inherited after the manner of a Mendelian recessive character in certain of the crosses made, skipping a generation and then reappearing. In other cases it has failed to reappear in generation F_2, indicating its complete extinction by the cross. In a few cases it has failed to be dominated by high productiveness in generation F_1. In such cases the female parent has always been of race *A*. Hence low productiveness (or sterility) of the female may be transmitted directly through the egg from mother to daughter, but only indirectly through the sperm, the character skipping a generation.

7. A cross between two races, one inbred for thirty or more generations and of low productiveness, the other inbred for less than ten generations and of high productiveness, produced offspring like the latter in productiveness, but not superior to it.

8. The same two races crossed after an additional year of inbreeding (about twenty generations) produced offspring superior to either pure race in productiveness.

9. Inbreeding does not affect the variability in number of teeth on the sexual-comb of the male.

10. This character is closely correlated with size.

W. E. CASTLE.

ZOOLOGICAL LABORATORY, HARVARD COLLEGE,
January 11, 1906.

CURRENT NOTES ON METEOROLOGY.

AUSTRALIAN DAILY WEATHER MAPS.

IN 1904 the Public Schools Associations in New South Wales appealed to the Sydney *Daily Telegraph* to publish daily a weather map for Australia in order that the pupils in the schools might be given instruction in meteorology by means of the maps. The *Telegraph* thereupon applied to the Sydney Observatory for a daily chart, to be supplied not later than 2 P.M., in order that it might appear in the evening editions which reach the country in time for use in the schools the